SHOCK-ABSORBING STRUCTURE FOR PNEUMATIC TOOL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to pneumatic tools and, more specifically, to a shock-absorbing structure for use in an pneumatic tool to absorb shocks from the impact unit.

2. Description of the Related Art

During the use of an pneumatic tool, more particularly a reciprocating type pneumatic tool, the action of the impact unit causes a heavy vibration. If the pneumatic tool has no means to absorb shocks, shocks will be directly transmitted from the impact unit to the user's hands, thereby causing an injury.

Therefore, various shock-absorbing designs and products are developed. However, these designs commonly use coil spring members or the like to absorb shocks. However, these conventional designs do not achieve a significant shock-absorbing effect. Further, it is difficult to control the coefficient of elasticity. Due to high-frequency vibrations, the parts of the shock-absorbing structure wear quickly with use and must be frequently replaced.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. It is one object of the present invention to provide a shock-absorbing structure for pneumatic tool, which effectively reduces impact shocks of the pneumatic tool.

It is another object of the present invention to provide a shock-absorbing structure for pneumatic tool, which is detachable for convenient assembly.

It is still another object of the present invention to provide a shock-absorbing

structure for pneumatic tool, which is durable in use.

To achieve these and other objects of the present invention, the shock-absorbing structure is installed in an pneumatic tool to absorb impact shocks from the impact unit of the pneumatic tool. The shock-absorbing structure comprises a housing, and a shock-absorbing socket. The housing comprises a mounting body, a first fitting hole and a second fitting hole formed in the mounting body, a receiving hole connected between the first fitting hole and the second fitting hole, a first locating portion disposed at a rear side of the first fitting hole remote from the receiving hole, and a second locating portion disposed in the second fitting hole. The shock-absorbing socket is mounted on the impact unit of the pneumatic tool, comprising a socket body axially movably mounted in the receiving hole inside the housing, a first coupling portion spaced from a rear side of the socket body and connected to the first locating portion of the housing, a second coupling portion spaced from a front side of the socket body and connected to the second locating portion of the housing, a first spring coil connected between the first coupling portion and the socket body, and a second spring coil connected between the second coupling portion and the socket body.

During reciprocating motion of the impact unit of the pneumatic tool, the first spring coil and the second spring coil are alternatively compressed and stretched to absorb shocks.

Preferably, at least one seal ring is mounted on the periphery of the socket body of the shock-absorbing socket and disposed in close contact with the inside wall of the housing within the receiving hole to prevent air leakage.

The first coupling portion of the shock-absorbing socket is preferably fastened to the first locating portion of the housing by a thread joint. The second coupling portion of the shock-absorbing socket is preferably fastened to the second locating

portion of the housing by a thread joint.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional installed view of a shock-absorbing structure according to the first embodiment of the present invention.

FIG. 2 is a side view in section of the housing for the shock-absorbing structure according to the first embodiment of the present invention.

FIG. 3 is a side view in section of the shock-absorbing socket for the shock-absorbing structure according to the first embodiment of the present invention.

FIG. 4 is a side view in section of the front cap for the shock-absorbing structure according to the first embodiment of the present invention.

FIG. 5 is a sectional installed view of a shock-absorbing structure according to the second embodiment of the present invention.

FIG. 6 is an exploded view of FIG. 5.

FIG. 7 is a side view in sectional of another alternate form of the shock-absorbing socket for the shock-absorbing structure according to the present invention.

FIG. 8 is a side view in section of still another alternate form of the shock-absorbing socket for the shock-absorbing structure according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a shock-absorbing structure in accordance with the first embodiment of the present invention is installed in an pneumatic tool and adapted to absorb impact shocks from the impact unit **8** of the pneumatic tool.

Referring to FIGS. 2~4 and FIG. 1 again, the shock-absorbing structure comprises a housing **10**, a shock-absorbing socket **20**, a front cap **30**, a first ring cushion

51, and a second ring cushion 52.

The housing 10 comprises a mounting body 11, a grip 12 extended from the mounting body 11, a first fitting hole 13 and a second fitting hole 15 formed in the mounting body 11, a receiving hole 14 connected between the first fitting hole 13 and the second fitting hole 15, a locating groove 141 and an air groove 142 respectively extended around the receiving hole 14, a first locating portion 16 (according to this embodiment, the first locating portion 16 is a thread hole) disposed at the rear side of the first fitting hole 13 remote from the receiving hole 14, a second locating portion 17 and a mounting portion 18 (according to this embodiment, the second locating portion 17 and the mounting portion 18 are thread holes) respectively disposed at the front open side of the second fitting hole 15 remote from the receiving hole 14, and an air passage 19 extended from the air groove 142 to the bottom side of the grip 12. Further, a seal ring 41 is mounted in the locating groove 141.

The shock-absorbing socket 20 comprises a socket body 21 axially movably inserted into the receiving hole 14 of the housing10 and peripherally closely disposed in contact with the inner diameter of the seal ring 41, an air chamber 22 defined inside the socket body 21, a thread hole 23 formed in the periphery of the socket body 21 in air communication with the air chamber 22 for enabling the socket body 21 to be affixed to the impact unit 8 of the pneumatic tool, a plurality of air holes 24 formed in the socket body 21 in air communication between the air chamber 22 and the air groove 142 of housing 10, an externally threaded first coupling portion 27 spaced from one side, namely, the rear side of the socket body 21 for threading into the first locating portion 16 of the housing 10, an externally threaded second coupling portion 28 spaced from the other side, namely, the front side of the socket body 21, a first spring coil 25 connected between the first externally threaded first coupling portion 27 and the socket body 21,

and a second spring coil **26** connected between the externally threaded second coupling portion **28** and the socket body **21**.

The front cap **30** comprises a cap body **31**, a mounting portion **32** extended around the periphery of the cap body **31** and threaded into the mounting portion **18** of the housing **10**, a through hole **36** axially extended through the cap body **31** for the passing of the impact unit **8**, a stop portion **37** disposed at one side of the cap body **31** and stopped at the externally threaded second coupling portion **28** against the second spring coil **26** of the shock-absorbing socket **20**, and an inside annular groove **38** disposed inside the cap body **31** around the through hole **36**. Further, a seal ring **42** is mounted in the inside annular groove **38** of the front cap **30**.

The first ring cushion **51** is mounted on the periphery of the socket body **21** within the receiving hole **14** of the housing **10** at the connection area between the first spring coil **25** and the socket body **21**. The second ring cushion **52** is mounted on the periphery of the socket body **21** within the second fitting hole **15** of the housing **10** at the connection area between the second spring coil **26** and the socket body **21**.

The assembly process and operation of the shock-absorbing structure are outlined hereinafter.

At first, the first externally threaded first coupling portion **27** and the first spring coil **25** are inserted with the shock-absorbing socket **20** into the first fitting hole **13** of the housing **10** to thread the externally threaded first coupling portion **27** and the externally threaded second coupling portion **28** into the first locating portion **16** and the second locating portion **17** respectively. When assembled, the seal ring **41** is sealed to the periphery of the receiving hole **14** inside the housing **10**, the air groove **142** of the housing **10** is in air communication with the air holes **24** of the shock-absorbing socket **20**, and the second spring coil **26** is suspended in the second fitting hole **15** of the

housing **10**. At this time, a gap **P1** is formed in between each two adjacent turns of the first spring coil **25**, and a gap **P2** is formed in between each two adjacent turns of the second spring coil **27**.

During operation of the pneumatic tool, the impact unit **8** is forced by air force from the air compressor (not shown) to carry the shock-absorbing socket **20** forwards (because of small position change, no further drawing to show the position change is necessary), thereby causing the first spring coil **25** to be stretched and the second spring coil **26** to be compressed, i.e., the gap **P1** is increased and the gap **P2** is reduced. Because of the two-way shock-absorbing effect of the shock-absorbing socket **20**, the sock-absorbing structure greatly lessens shocks from the housing **10** during forward stroke of the impact unit **8**.

When in the reversed direction, i.e., when the impact unit **8** pressed against the workpiece or moved backwards, a high pressure is given to the shock-absorbing socket **20**. At this time, the first spring coil **25** is compressed to reduce the gap **P1** and the second spring coil **26** is stretched to increase the gap **P2**, lessening shocks from the housing **10**.

Therefore, the first spring coil **25** and the second spring coil **26** are respectively and alternatively compressed and stretched to lessen shocks during reciprocating motion of the impact unit **8**.

FIGS. 5 and 6 show a shock-absorbing structure according to the second embodiment of the present invention. Similar to the aforesaid first embodiment, this second embodiment is also comprised of a housing **10A**, a shock-absorbing socket **20A**, and a front cap **30A**.

According to this embodiment, the first and second fitting holes and receiving hole of the housing **10A** are substantially equal in diameter. The housing **10A** further

has an annular stop edge **17A** disposed inside the mounting portion **18A**.

The socket body, first spring coil and second spring coil of the shock-absorbing socket **20A** have the same outer diameter. The socket body of the shock-absorbing socket **20A** has two outside annular grooves **29A** for the mounting of a respective seal ring. The second coupling portion **28A** of the shock-absorbing socket **20A** is a flange (without outer thread), which is stopped at the stop edge **17A** of the housing **10A**. Further, the shock-absorbing socket **20A** has a hexagonal hole **251A** disposed at one end inside the first spring coil for the positioning of a wrench to thread the shock-absorbing socket **20A** into the housing **10A**.

The front cap **30A** is threaded into the mounting portion **18A** of the housing **10A**, having a stop portion **37A** adapted to stop the second coupling portion **28A** of the shock-absorbing socket **20A** against the annular stop edge **17A** of the housing **10A**. This second embodiment works similar to the aforesaid first embodiment, and achieves same effect.

FIG. 7 is a sectional view of the shock-absorbing socket according to another alternate form of the present invention. According to this alternate form, the first spring coil **25B** and the second spring coil **26B** have a circular cross section. The first spring coil **25B** and the second spring coil **26B** may be formed integral with the socket body by lathing. Alternatively, the first spring coil **25B** and the second spring coil **26B** can be made by die cast or sand cast.

FIG. 8 is a sectional view of the shock-absorbing socket according to still another alternate form of the present invention. According to this alternate form, the socket body **21C**, the first spring coil **25C**, the second spring coil **26C** are independent members respectively fastened together by any of a variety of fastening measures, for example, thread joint, welding, riveting.

Further, the seal ring between the periphery of the socket body of the shock-absorbing socket and the receiving hole of the housing may be eliminated, for enabling compressed air to be directly guided to the impact unit. The grip may be made detachable so that the user can attach any of a variety of grips to the mounting portion of the housing. This detachable grip design enables the housing to be processed by a lathe or machine tool.

As indicated above, the invention has the following features:

1. The two-way shock-absorbing design of the shock-absorbing socket doubles the shock-absorbing effect of the shock-absorbing structure.

2. The simple design of the shock-absorbing socket and the hosing enables the user to detachably assemble the shock-absorbing structure with less effort.

3. Due to the perfect design and way of work of the shock-absorbing socket, the shock-absorbing structure is durable in use.